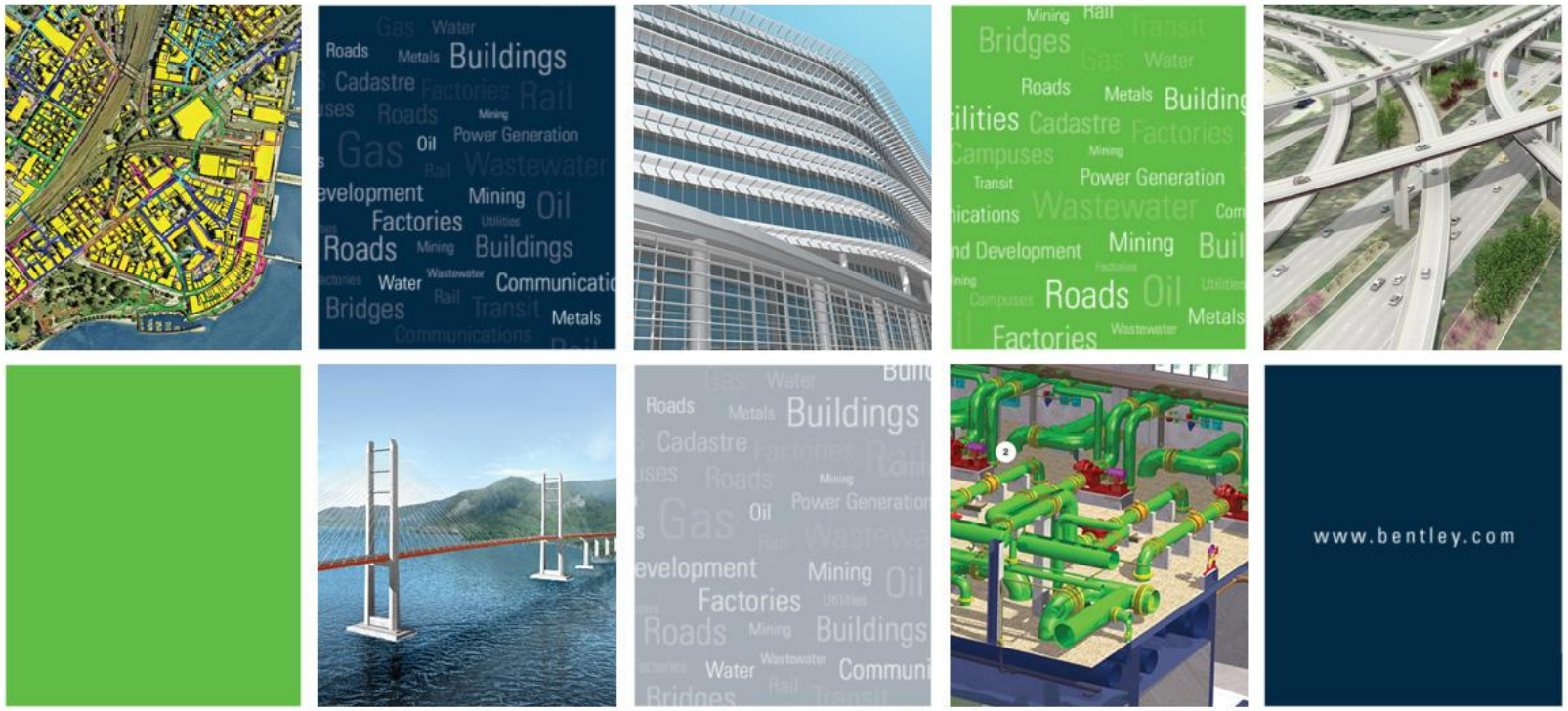


These Changing Times

Derricke Gray
GEOPAK Product Manager

MC² 2009 Conference

Bentley
Sustaining Infrastructure

EXTRA! EXTRA!

"Intergraph dominated the recent AEC Expo show in New York. The big news: a low-cost desktop workstation, the InterPro 120, running what Intergraph calls its "professional series" software. The InterPro, with 156 MB hard disk, 6 MB of RAM, MicroStation 32 CAD software, UNIX V, a command "shell" designed for AEC applications, 19-inch monitor, network capability, and computer-aided tutorials, costs about $21,000.

February 1989 edition of the ARCHITECTURAL RECORD, page 148

"Iris Graphics of Bedford, Mass. showed a spectacular inkjet printer, the 3024, with color rendition good enough to have been used for the past year in printing plants making color proofs. The system is fast, too, producing 11 by 17 prints in about 10 minutes, for about $2 worth of materials. The system isn't cheap … $75,000 for the printer, and another $50,000 or more for the computers to run it."

February 1989 edition of the ARCHITECTURAL RECORD, page 148

Note: You might be old if you recognize these.

Note: You might be *really* old if you recognize this.

“There is nothing permanent except change.”

Heraclitus (Greek Philosopher)

Business Trends

- It's ALL about project delivery
  - Design-Build and Design-Build-Maintain projects will become more the norm as public funding diminishes
  - Sub-contracting by DOTs to Engineering Consultants is the norm. In house review and management.
  - Driven by construction contractors, machine control is gaining popularity and requires a full 3D Model.
  - Ageing Infrastructure can't be ignored. It is about 3R Design Capabilities (Resurface, Reconstruction, Rehabilitation)
  - Increasing call for accessing the carbon footprint of developing, operating and maintaining new infrastructure projects

Technology Trends

- Inevitable shift to Machine control and Construction Automation
- Traditional Design-Bid-Build linear paper based workflows are quickly being superseded by dynamic, real-time digitally based best practices
- Better User Experience
- ***Model-centric designs***

New Challenges

- Finding and merging project data from multiple sources in disparate formats
- Managing project revisions in real-time
- Communicating just-in-time decisions to project stakeholders
- Supplying project deliverables to diverse stakeholder personas
- Judging the constructability and long term sustainability of the infrastructure

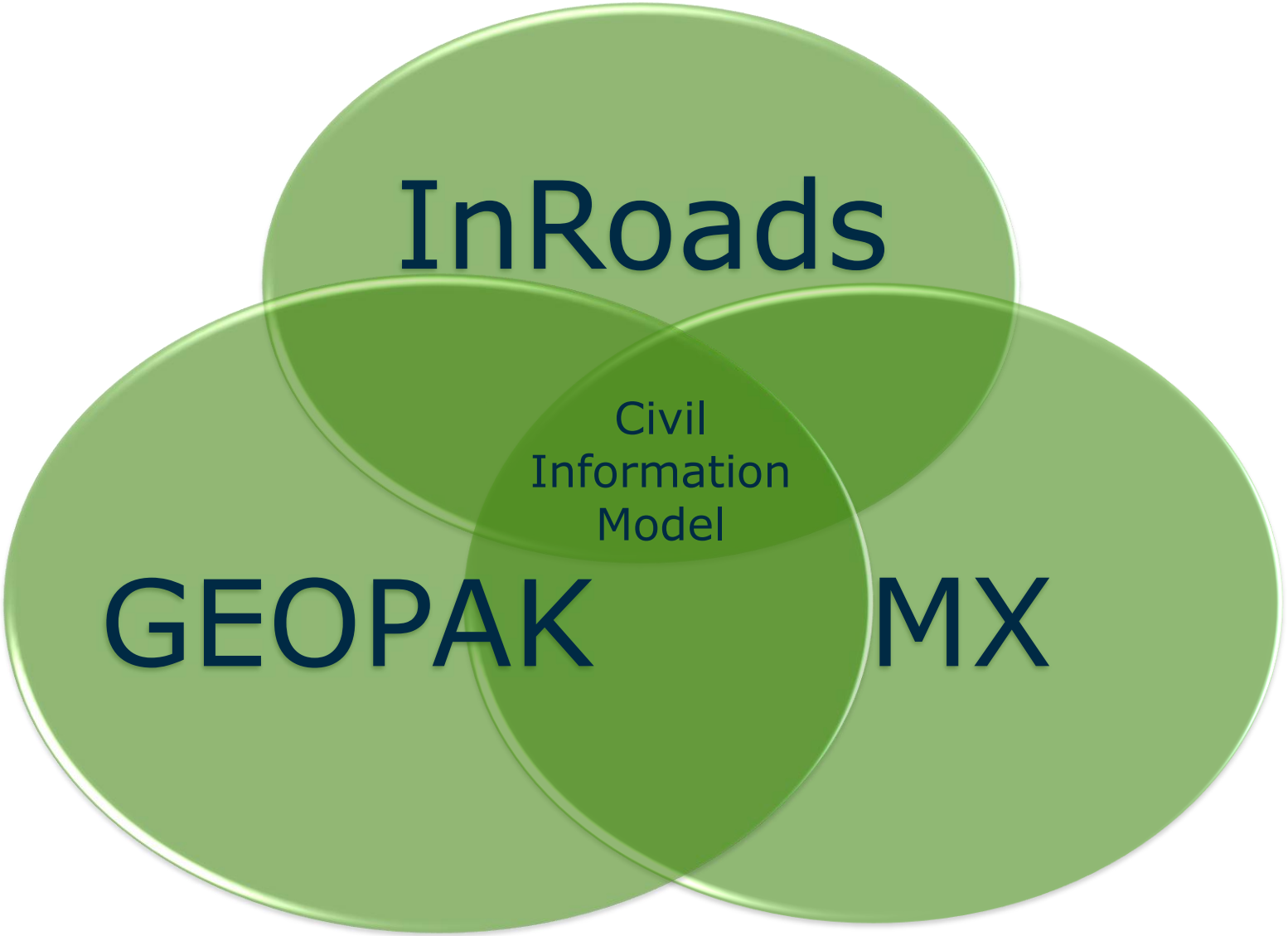
To some, the road ahead can look like this …

… or this!

Roadmap Goals

- **Reduce Risk**
- **Save Money**
- **Improve Quality**
- **Preserve your investment**

Roadmap Destination



Model-centric Designs

Design Tools

Model

Why a ‘model-centric’ design process?

"**Specialists in the various disciplines have been able to optimize their own in-house operations … most failures are caused by *poor handoffs between disciplines*.**"

Tommelein and Gil (1999)

Problem in Our Industry

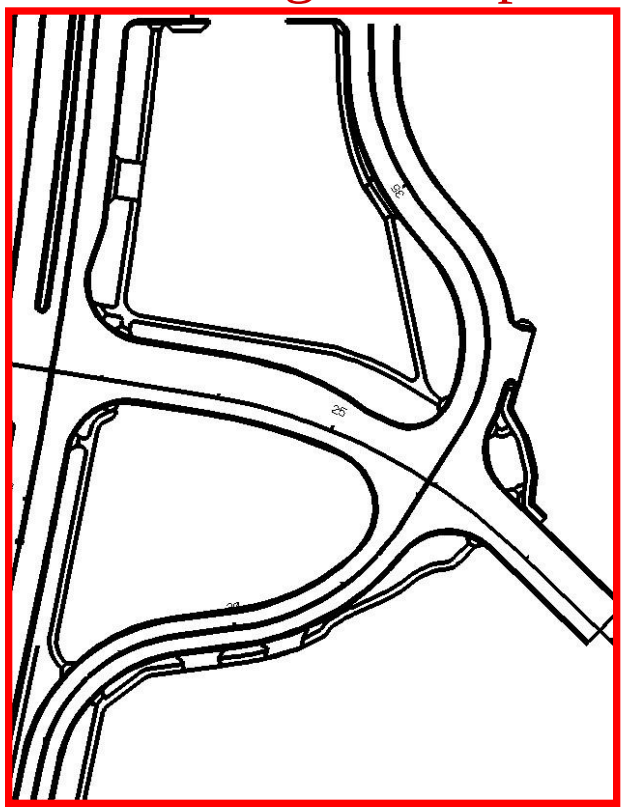
Single worse impediment to transportation and civil engineering productivity?

Information Flow

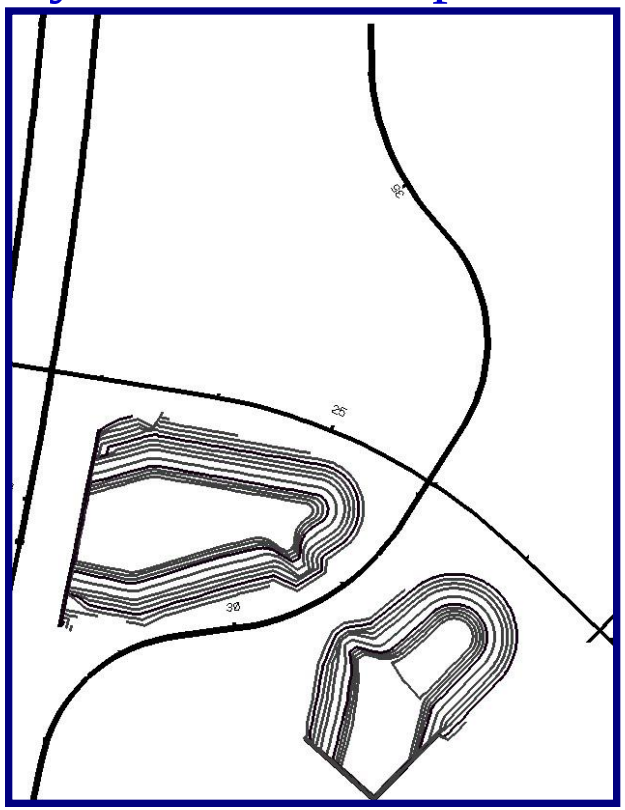
- Incomplete
- Inefficient
- All too often…Incorrect due to Errors and Omissions

Inter-discipline Design Pond/Road Example

Road Design Viewpoint

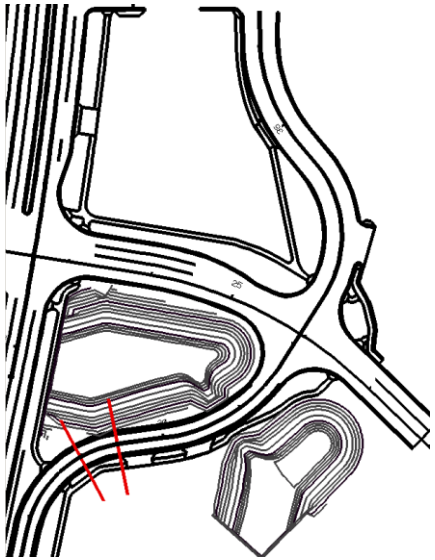


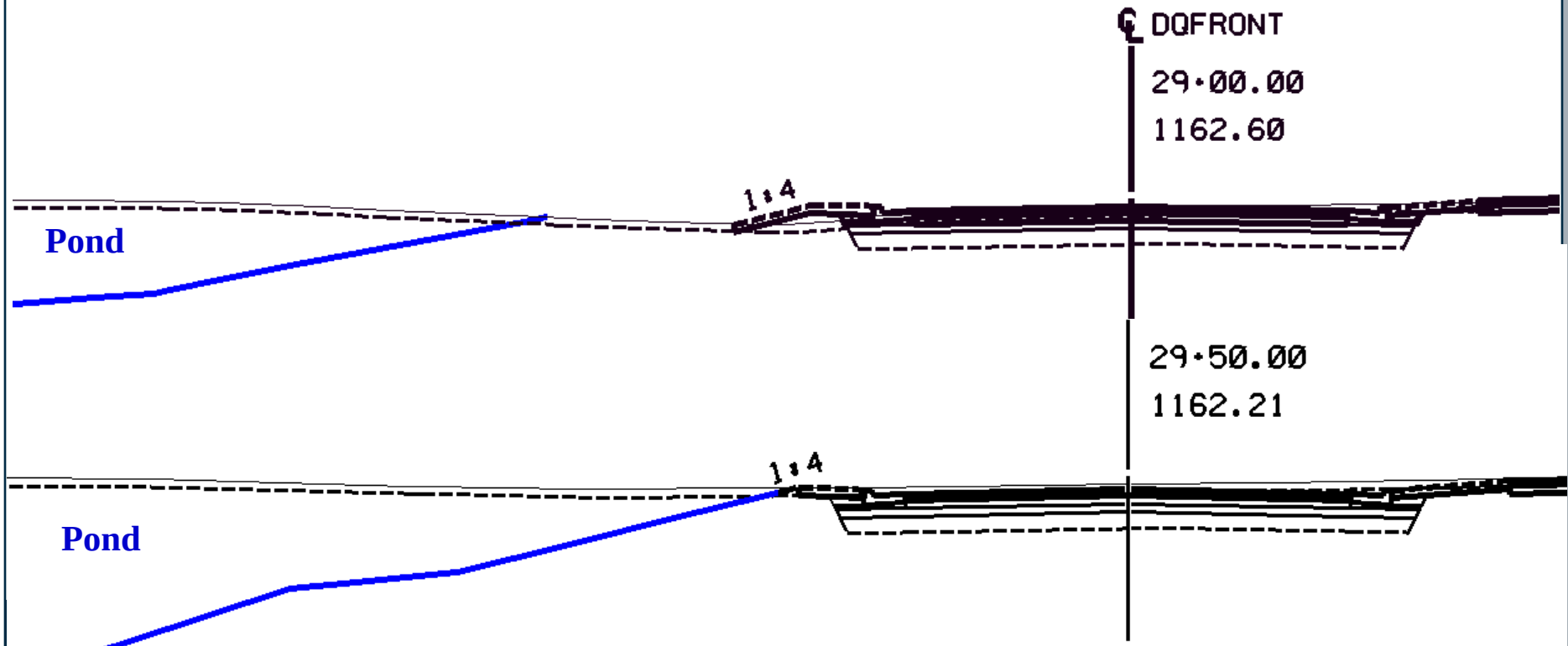
Hydraulics Viewpoint



Pond/Road Example

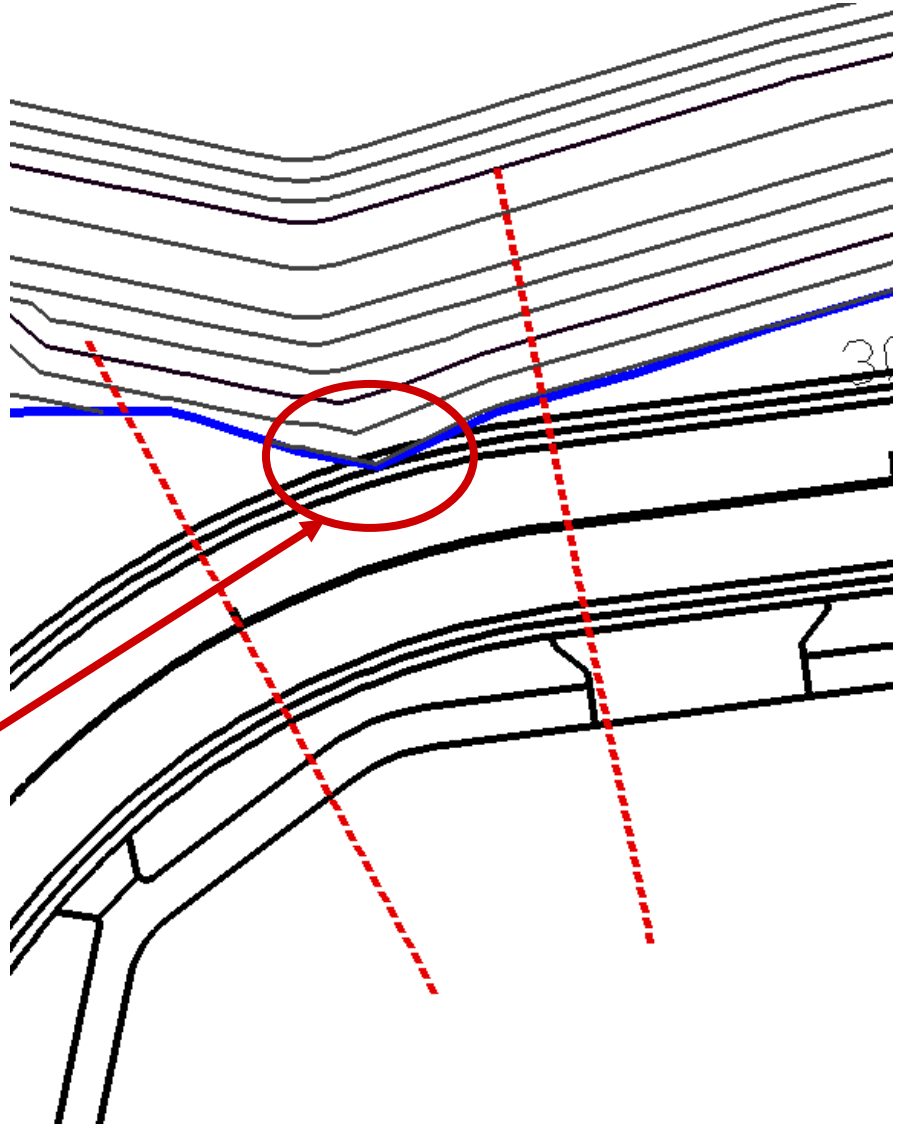
- Road designer astute in that ponds were depicted on cross sections:





Pond/Road Example

As [bad] luck would have it, cross sections at 29+00 and 29+50 missed intrusion of pond edge over curb & gutter.



A view that the Road Designer never saw.

Incomplete

"…**the transmission of information across the construction elements is awkward and incomplete.**"

Fosburgh and Paiva (2001)

Incomplete Information Flow

Incomplete Information Flow

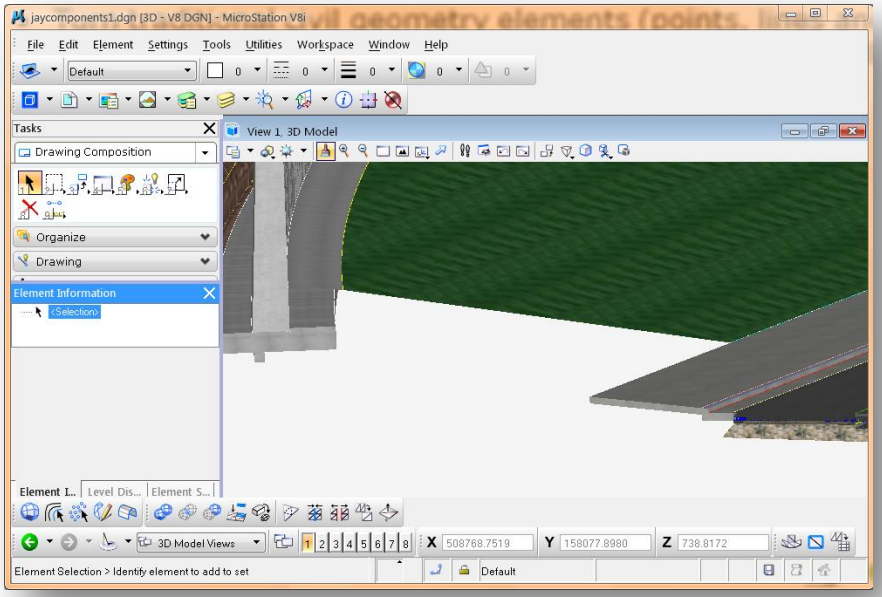
The Roadmap Highlights

- Users will leverage Bentley Civil products to…
  - Take advantage of a ***Civil Information Model*** technology to facilitate down stream construction technologies
    - Machine Control
    - Cost Estimating and Bidding
    - Construction sequencing
    - Sustainable infrastructure
  - Judge whether their projects are reviewable, constructible and sustainable.

Civil Information Model

Intelligent Object Modeling

- Traditional civil geometry elements such as are transformed into real-world components such a
  - points, lines, triangles become curbs, walls, pavement

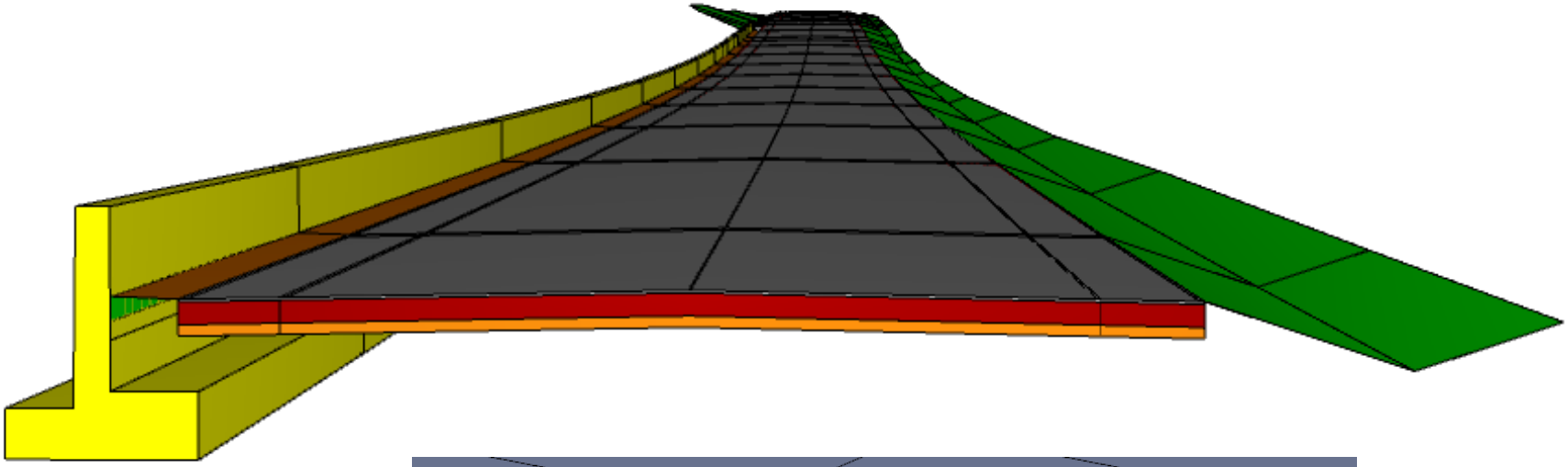


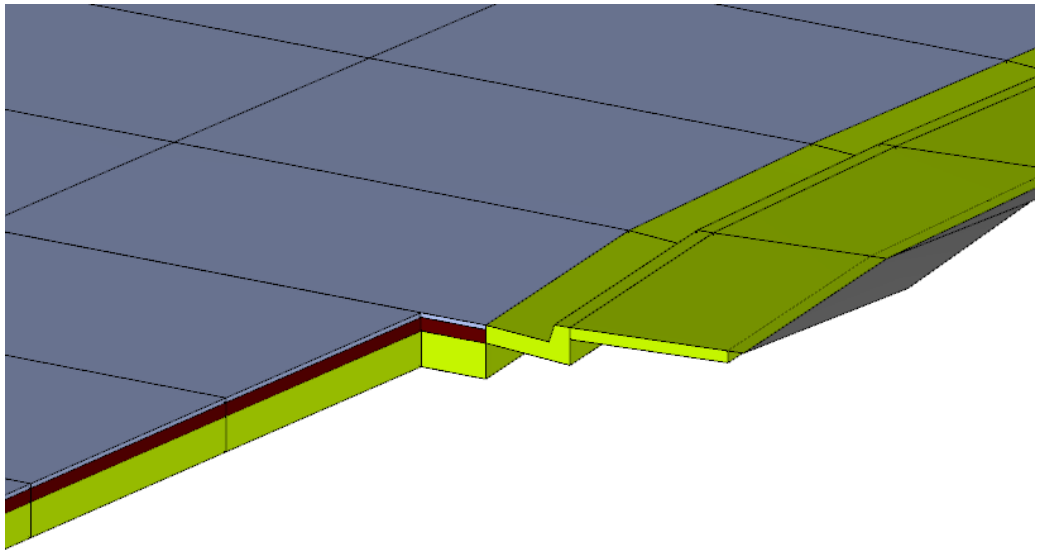
Bentley

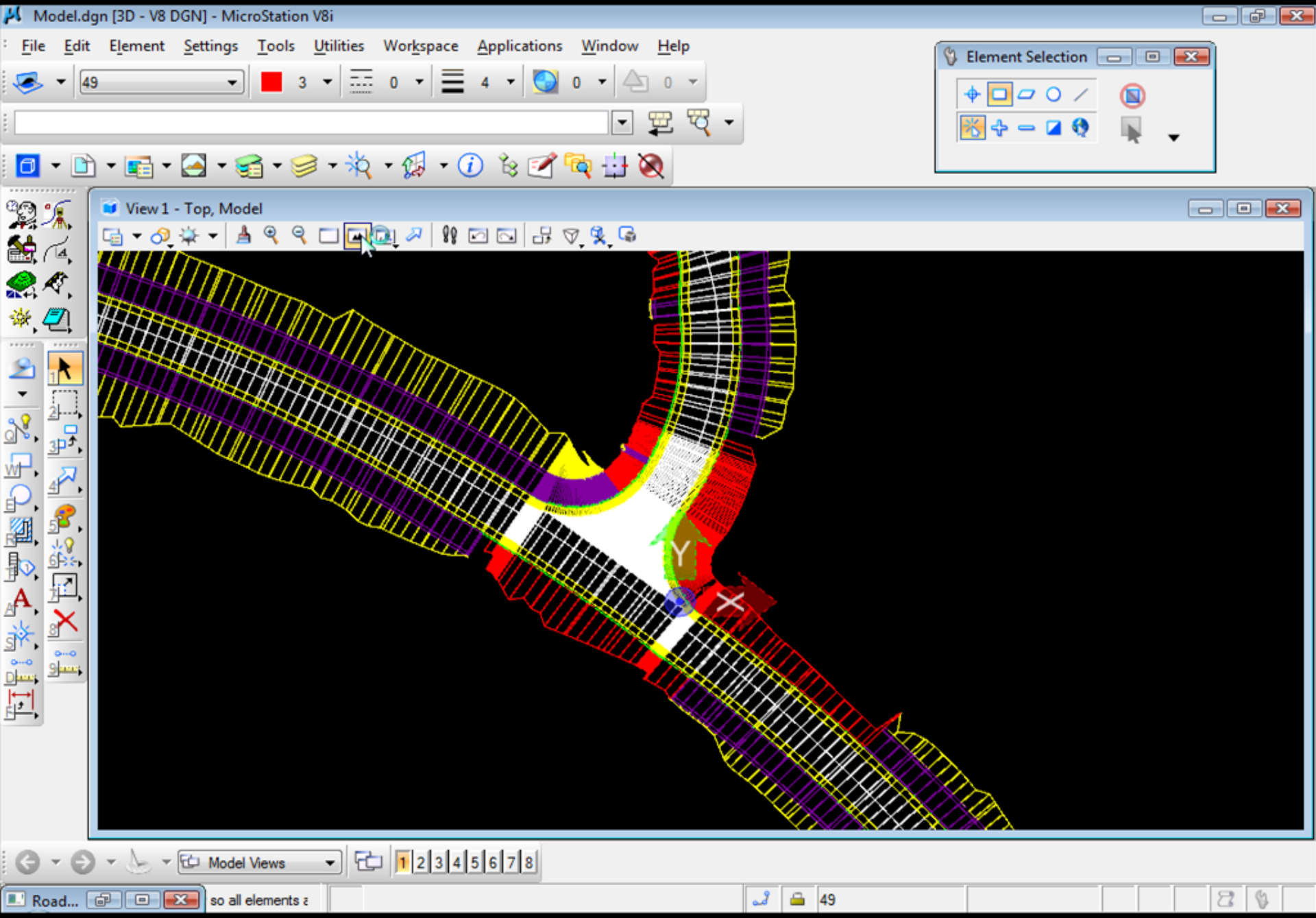
Civil Information Model

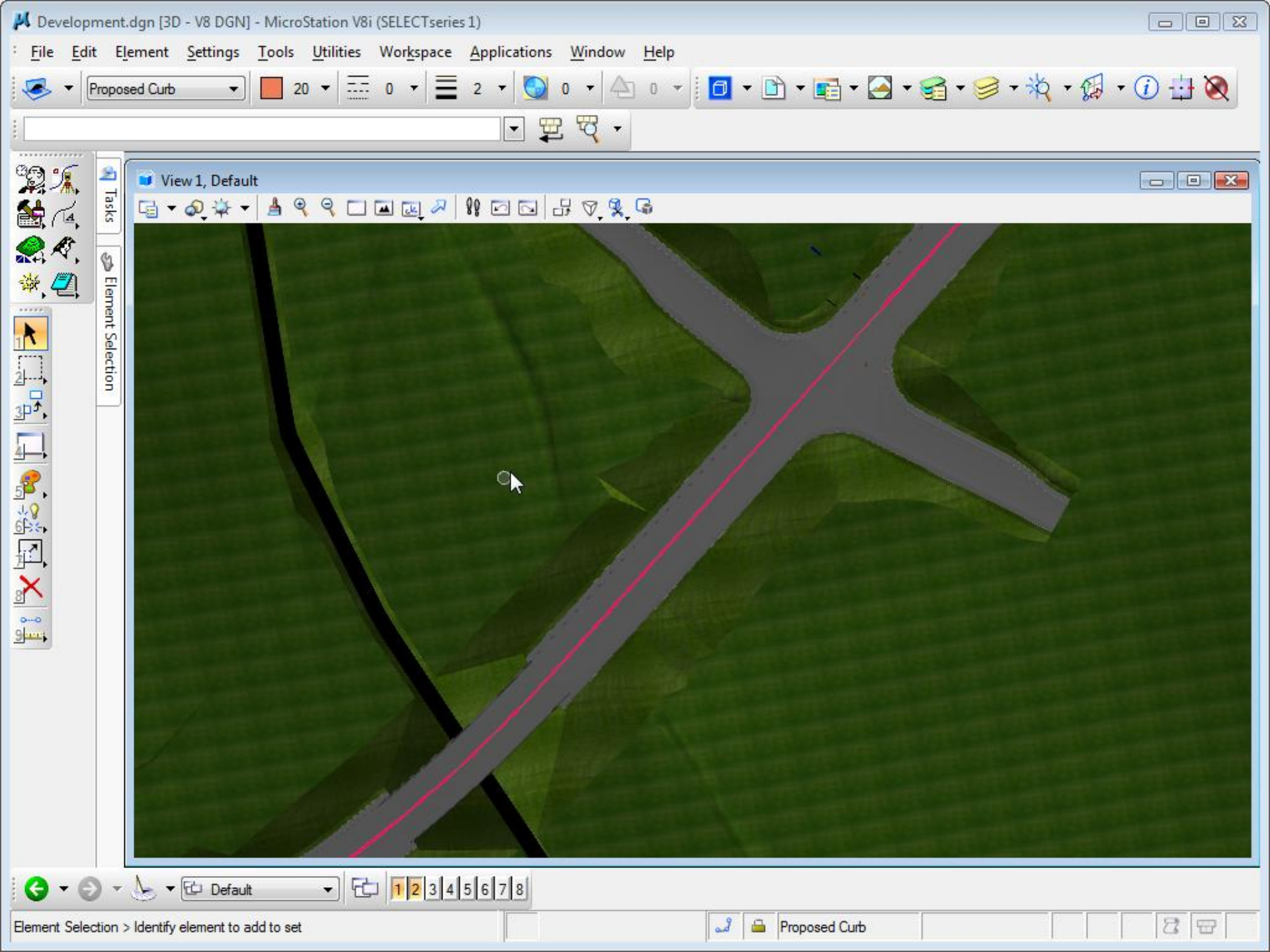
- "Rules" driven
  - Capture design intent
  - Rules and relationships to actively participate in the design or monitor critical relationships.
- Full 3D (and 2D)
  - Although we want to create a 3D model this does not require we work in 3D – work in what suits the need and the known's.
- Extendible Civil Data
  - Customizable properties for customer business information
  - ***Review and Analysis is a primary consideration***

Civil Information Model






Model.dgn [3D - V8 DGN] - MicroStation V8i
File Edit Element Settings Tools Utilities Workspace Applications Window Help
Element Selection
View 1 - Top, Model
Model Views
Road...
so all elements a
49


Development.dgn [3D - V8 DGN] - MicroStation V8i (SELECTseries 1)
File Edit Element Settings Tools Utilities Workspace Applications Window Help
Proposed Curb
20
0
2
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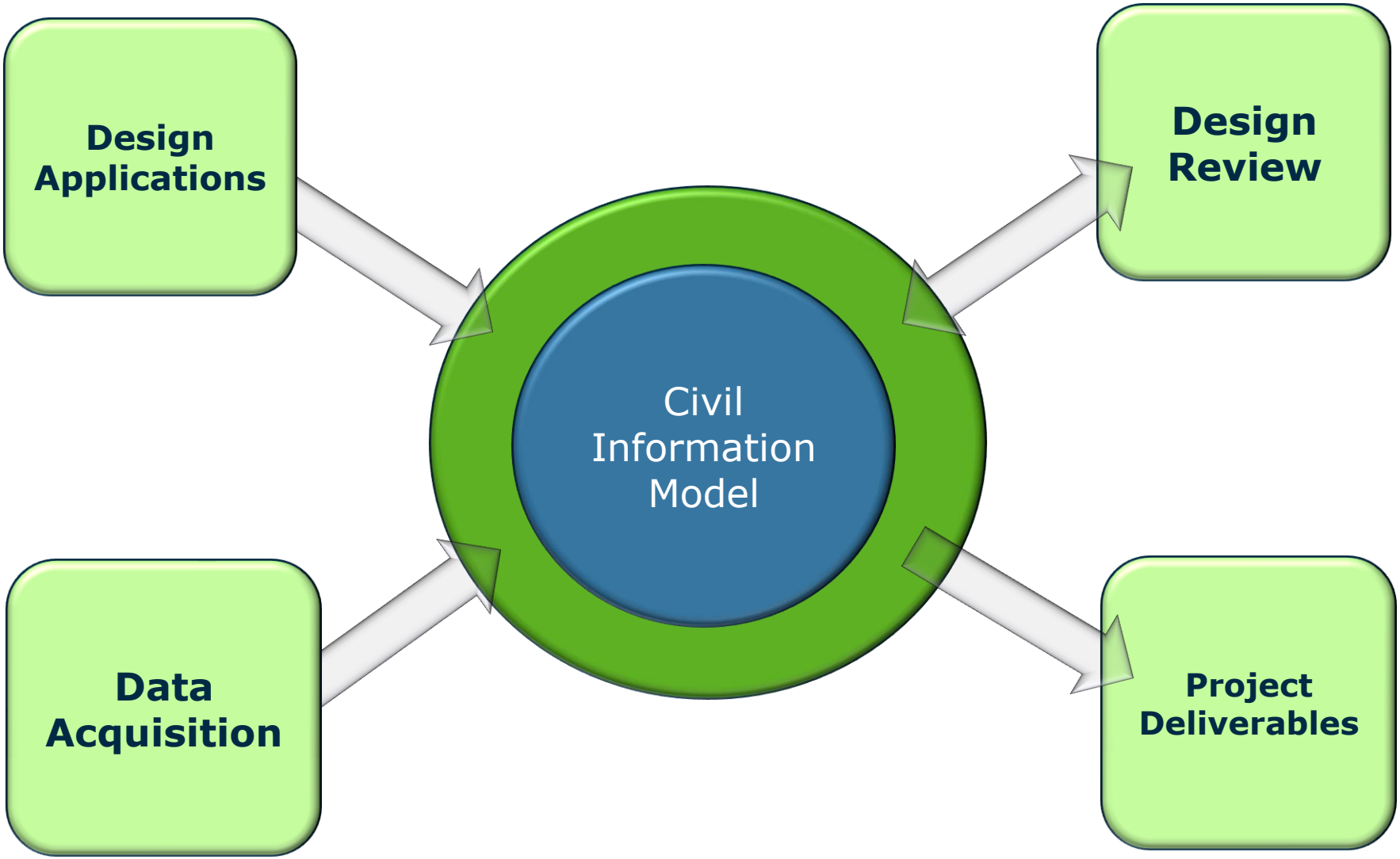
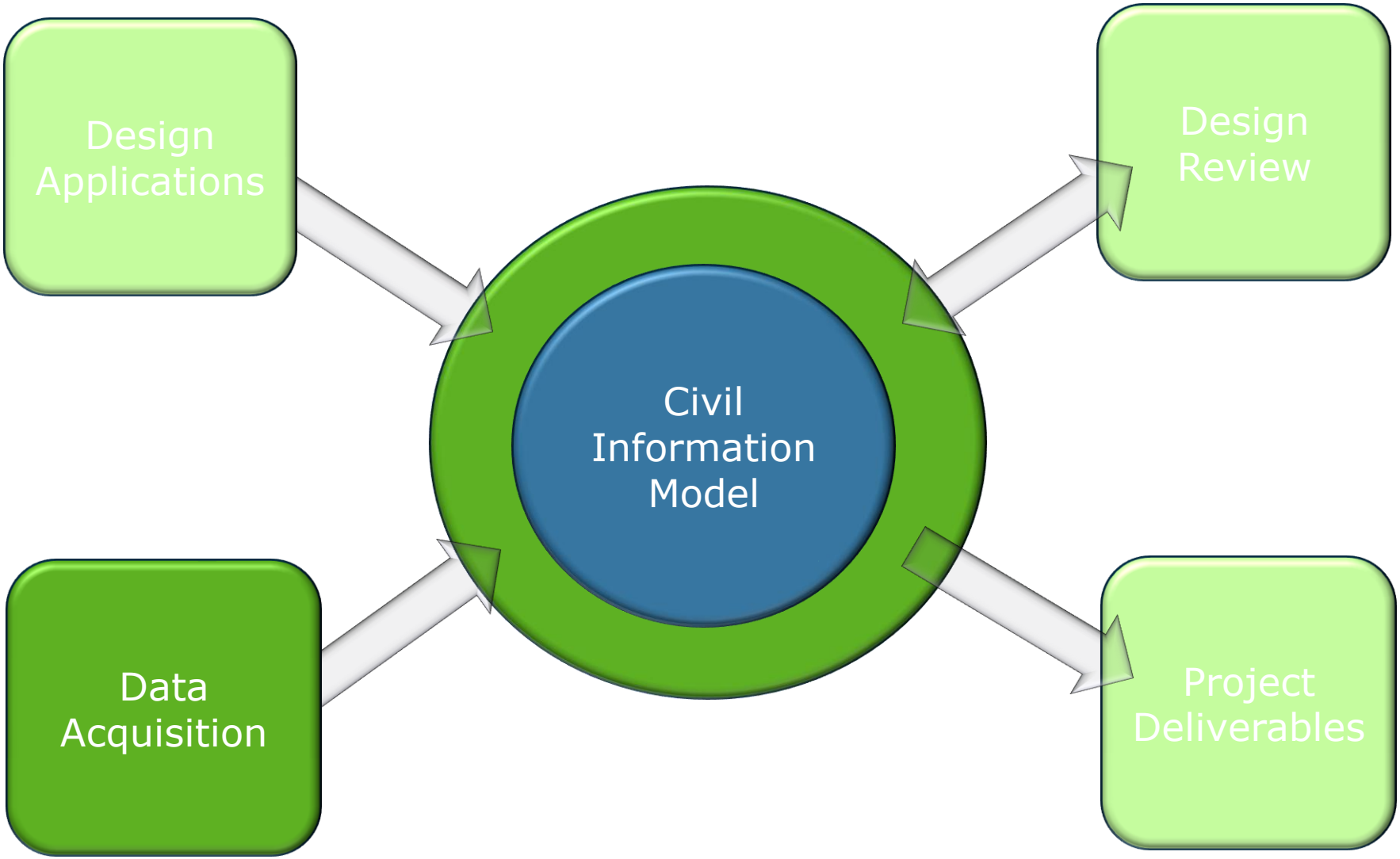
0
View 1, Default
Tasks
Element Selection
Default
1 2 3 4 5 6 7 8
Element Selection > Identify element to add to set
Proposed Curb

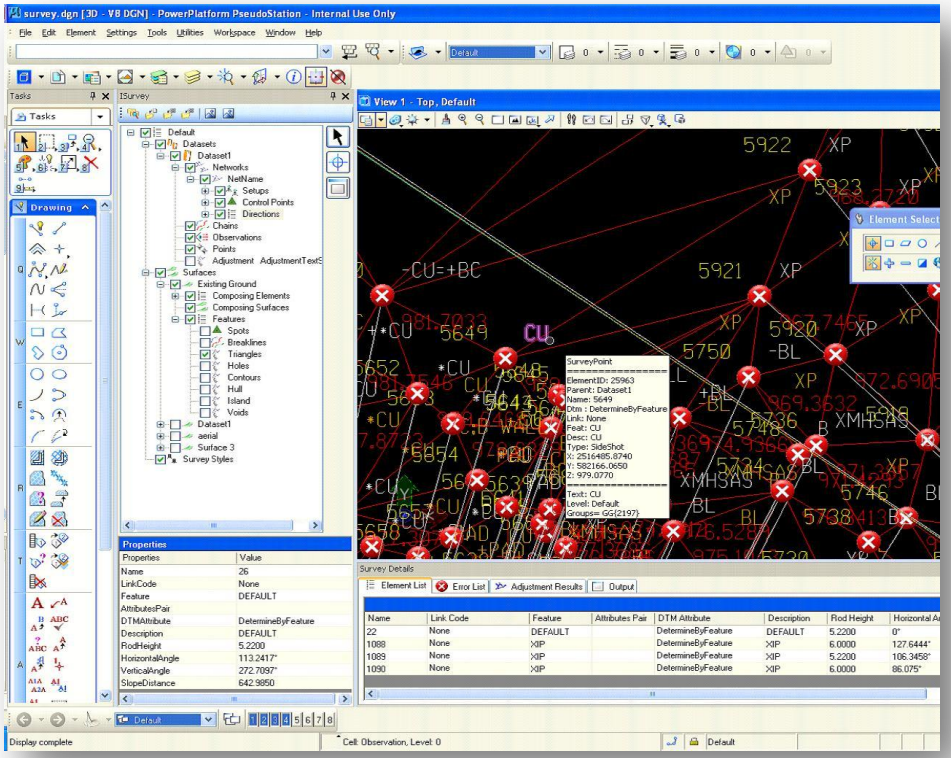
Civil Information Model



Civil Information Model



NEW! Data Acquisition Tools



- Easy to use
- Graphically driven
- Accepts multiple data types
- Total Station
- GPS
- DEM
- LIDAR
- Delivered with all civil products
- Does not replace existing survey functionality

Bentley

Data Acquisition

- A platform for:
  - Acquiring,
  - Reducing,
  - Combining,
  - Collaborating,
  - Merging,
  - Resolving,
  - and Managing

…disparate data sources.

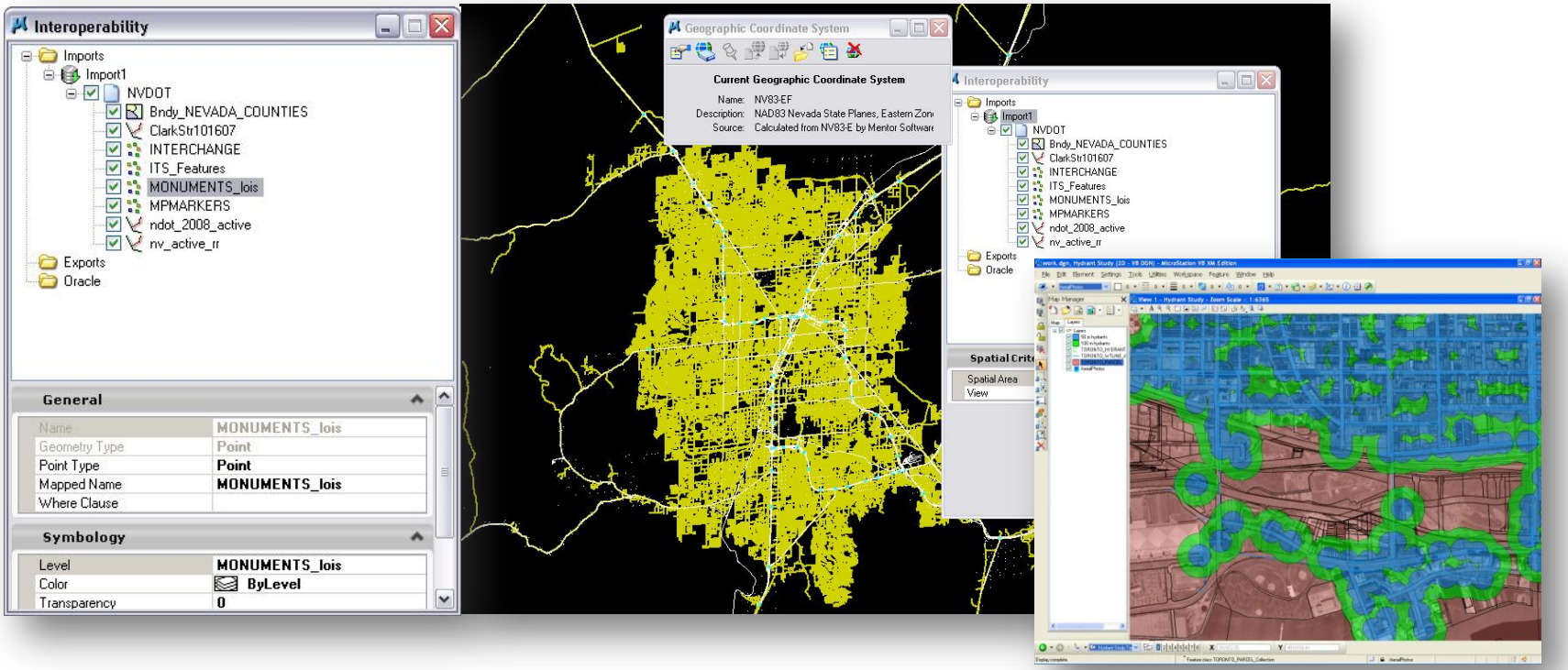
Data Sources

- Digital Elevation Model (DEM) formats
  - DTED
  - Erdas IMG
  - SPOT Dimap
  - USGS DEM ASCII
  - USGS STDS DEM
- Terrain Model formats:
  - GEOPAK TIN
  - InRoads DTM
  - MX FIL
  - LandXML 1.2
- LIiDAR
  - XYZ (ascii)
  - LAS (binary raw lidar files)
- 3rd Party formats:
  - Land Desktop LDD
  - Caice PT4
- Survey formats:
  - GEOPAK OUT intermediate format
  - GEOPAK OBS intermediate format
  - Inroads FWD intermediate format
  - MX WRW intermediate format
  - LandXML 1.2
  - Field Genius
  - Trimble DC
  - Leitz/Sokkia SDR2, SDR33 & SDR33-14
  - Tripod Data Systems TDS 48, 95 & FS2
  - Geodimeter 122, 126, 400, 500 & 600
  - SMI versions 5, 6 & 7
  - Topcon FC1, FC2, FC4, FC5, CR2, Propac, FC48-95 % FC5-725
  - Leica Data Pro, Digital Level, RTA-GSI, GEOComp
  - Wildsoft GIF 2 & GIF 10
  - Nikon DR1, DR2, 48 & 302
  - South African TachiBook
  - CG-Field and CG-Field plus
  - Pentax DC1 & DC1Z
  - Zeiss Rec200 and Rec 500
  - CO OP
  - Hayes
  - Kern
  - AASHTO SDMS
- Survey Hardware interaction
  - Trimble Link
  - Leica DBX

GEOPAK V8*i* - Bentley Map Integration

Bentley Map will be integrated and delivered with GEOPAK V8*i* (SELECTseries 1)

- Import and export GIS shape (SHP) files



NEW! Geo-Coordination

Intrinsic Geo-Coordination

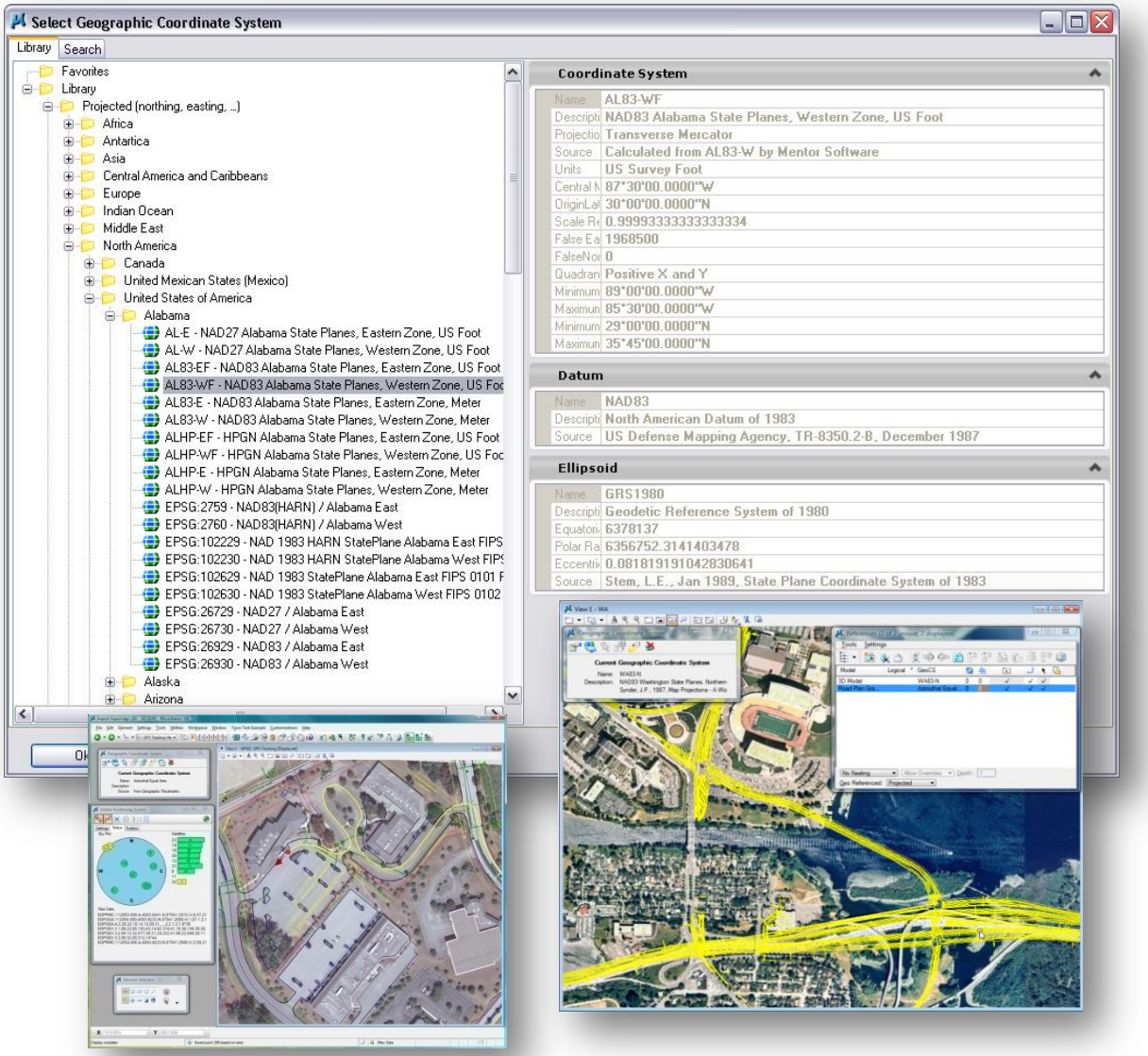
Set or change your coordinate system with the push of a button

Advantage

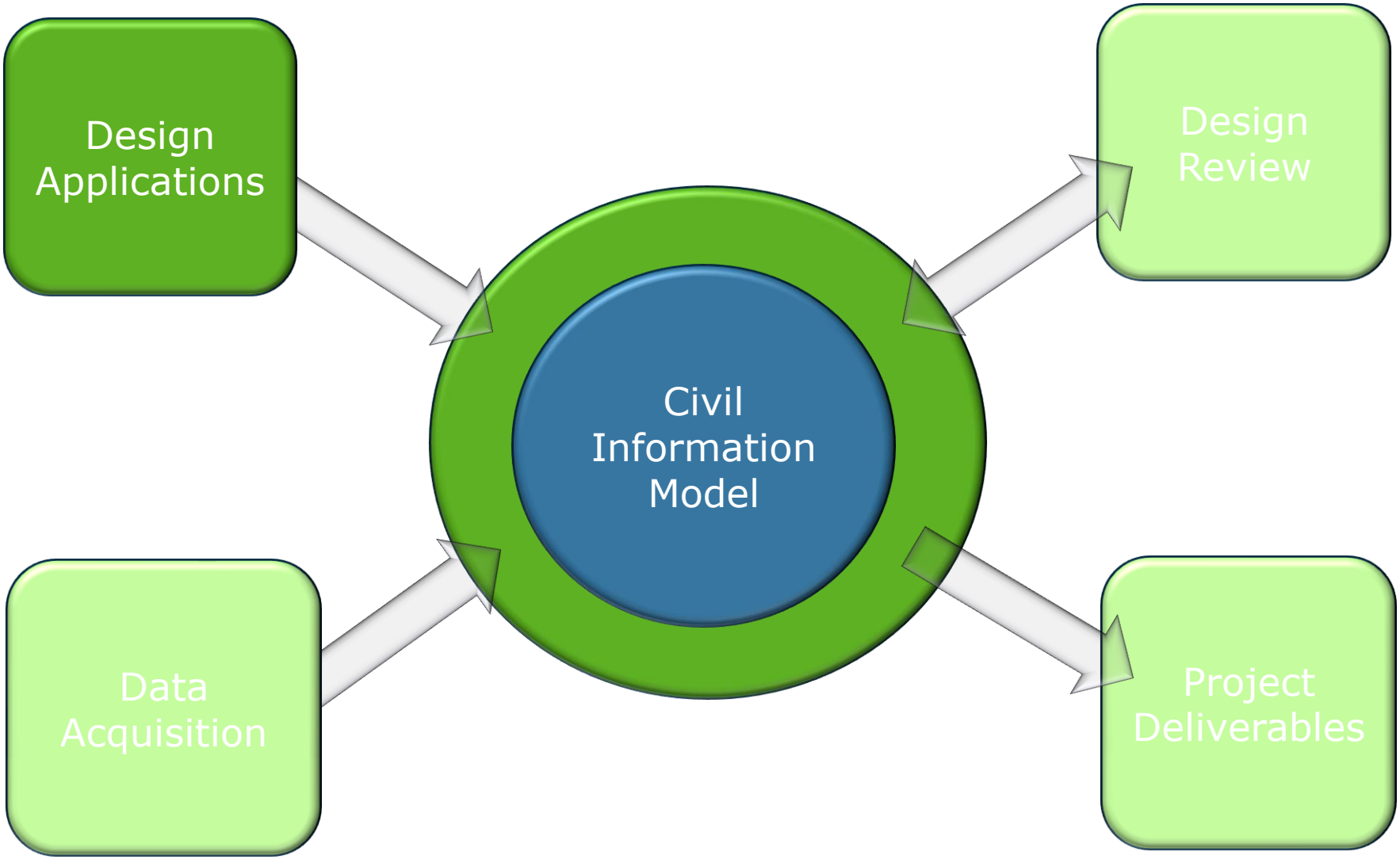
Seamlessly integrate content from multiple GIS and AEC sources into defined project coordinate systems.

Benefits

- No complex transformations
- Save time coordinating data
- Improve information quality
- Reduce risk of errors onsite



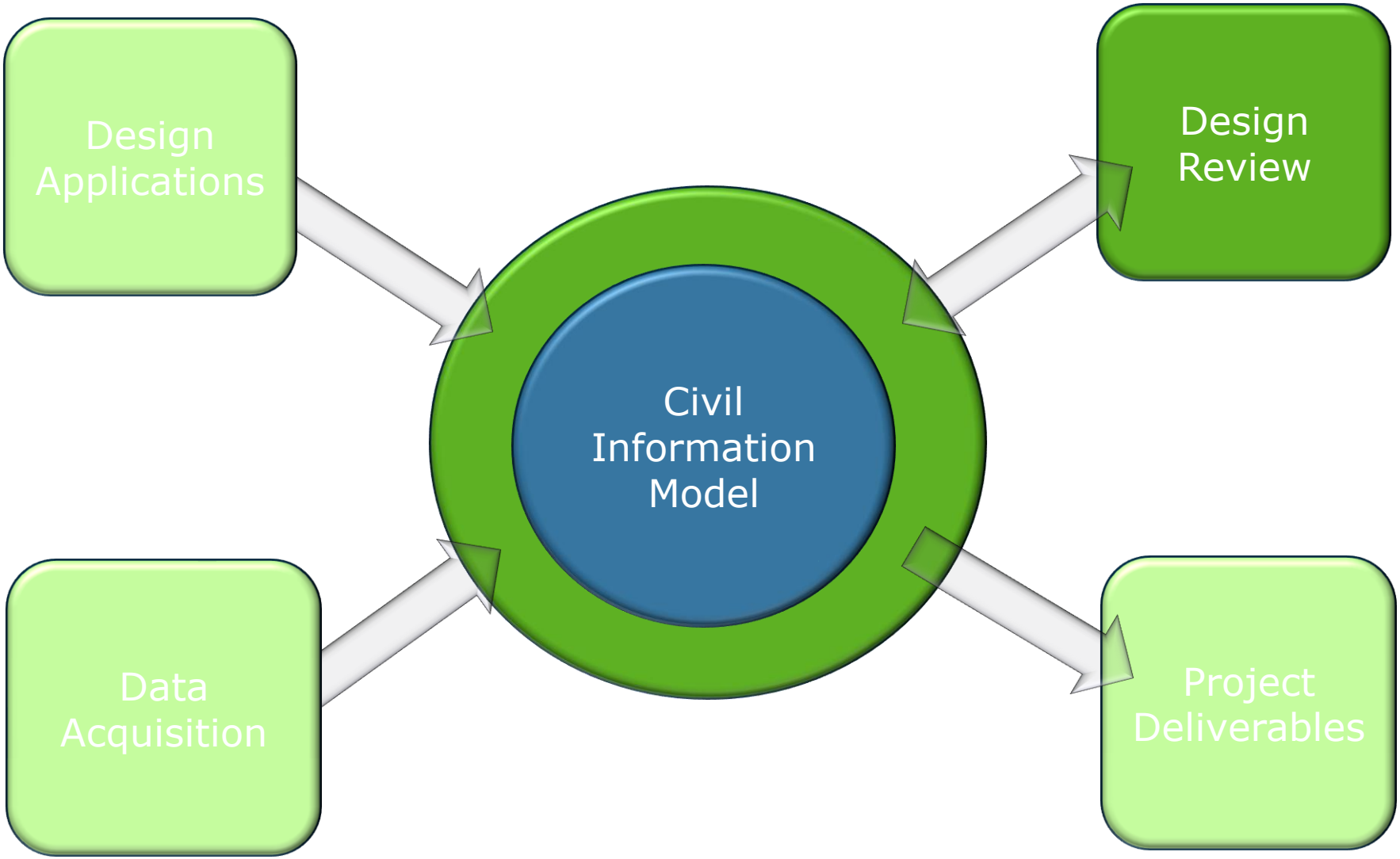
Civil Information Model



Design Applications Enhancements

- V8*i* (SELECTseries 1)
  - Site Modeling
  - Geometry
  - Roadway Designer
  - Overlay
  - User Experience Improvements
- Post V8*i* (SELECTseries 1) ...
  - Visualization
  - Intersection Design
  - Underground Utility Modeling

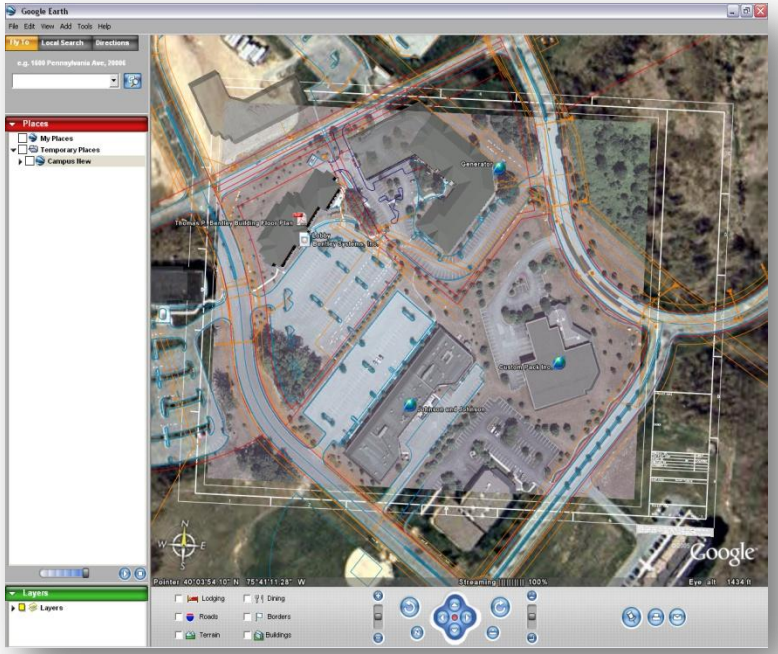
Civil Information Model

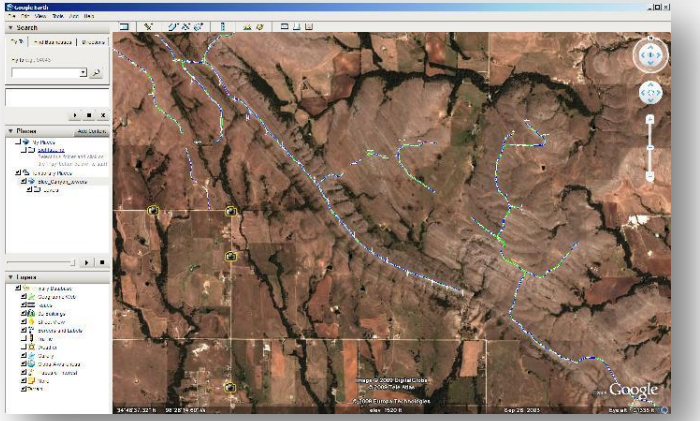


Google Earth Tools

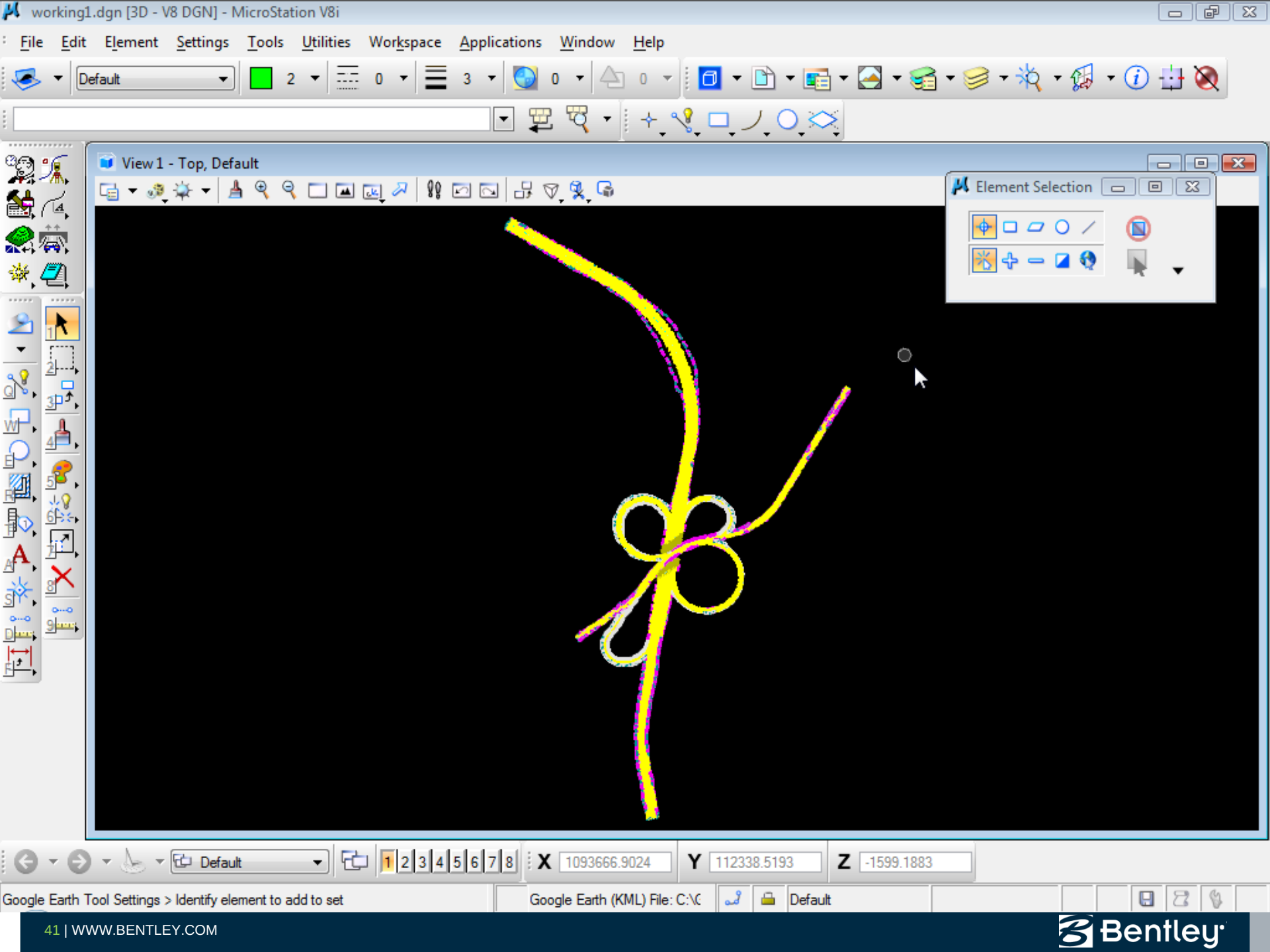
Publish DGN and DWG models directly to Google Earth

- DGN, DWG and other content
- Reference and level control
- Transparency
- Links
- Raster
- Google Earth v4 / KML 2.1 support
- Capture image and terrain
- Control animation path

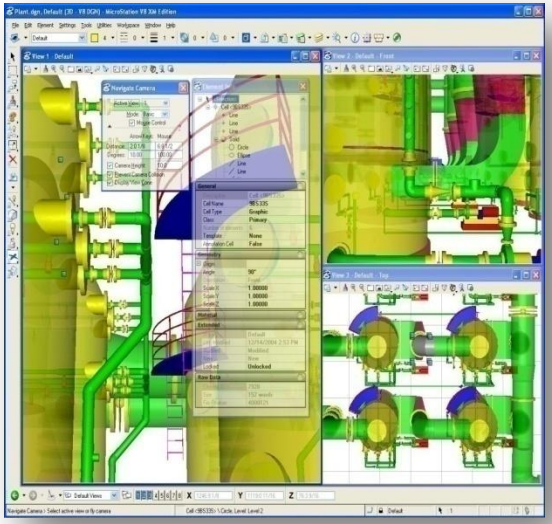




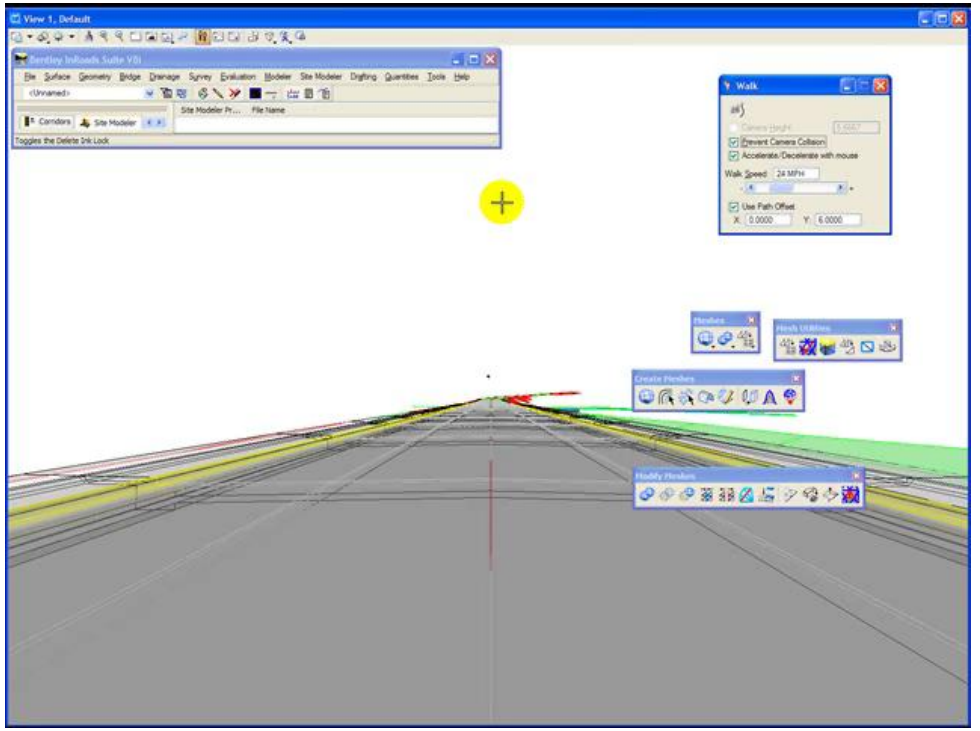
Blue_Canyon_towers.kmz


working1.dgn [3D - V8 DGN] - MicroStation V8i
File Edit Element Settings Tools Utilities Workspace Applications Window Help
Default
View 1 - Top, Default
Element Selection
Default
1 2 3 4 5 6 7 8
X 1093666.9024
Y 112338.5193
Z -1599.1883
Google Earth Tool Settings > Identify element to add to set
Google Earth (KML) File: C:\
Default

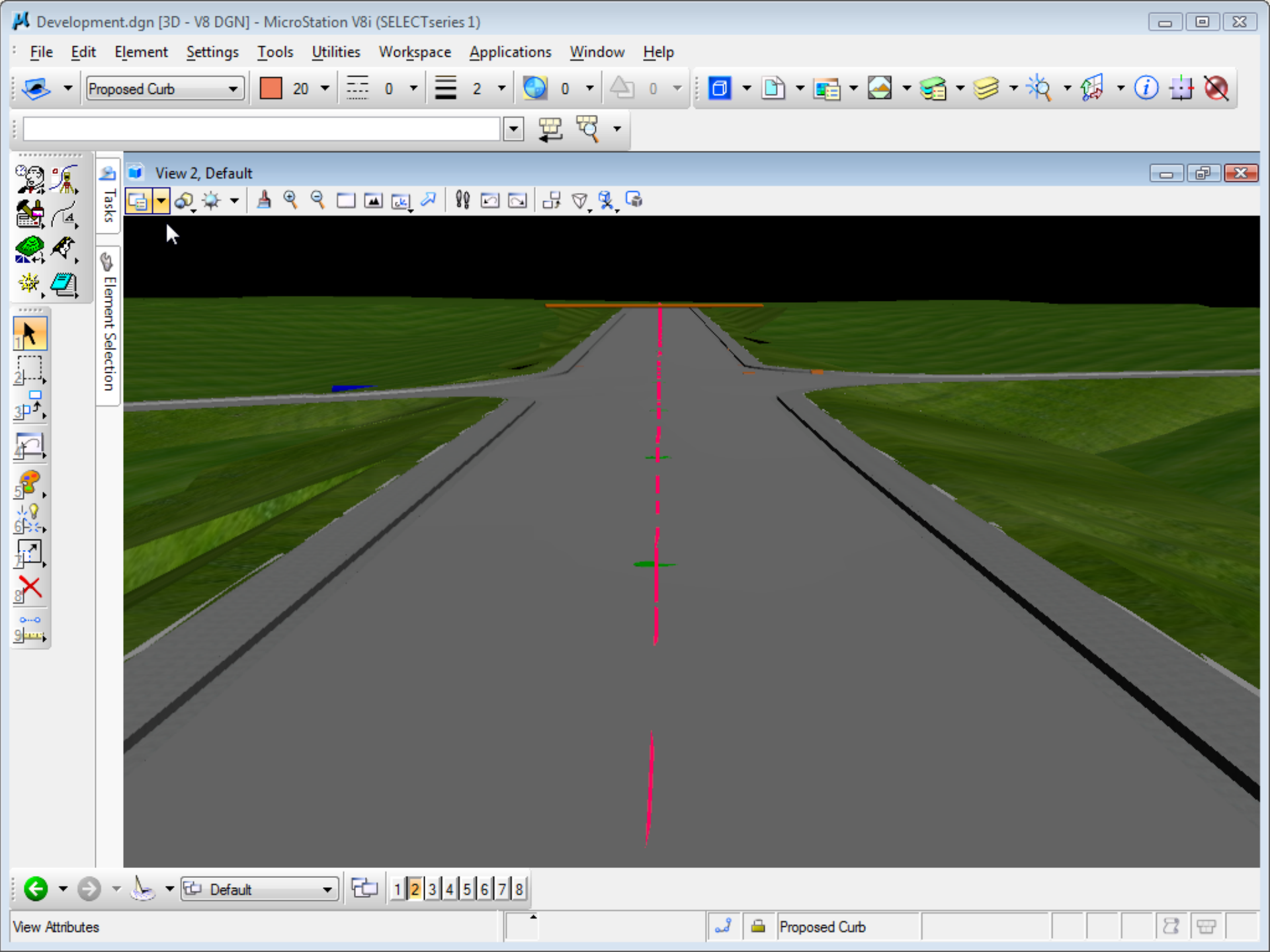
Enhanced Element Transparency



Adding *WOW-power* to design, drafting, mapping, and visualization



Improves clash detection and visualization


Development.dgn [3D - V8 DGN] - MicroStation V8i (SELECTseries 1)
File Edit Element Settings Tools Utilities Workspace Applications Window Help
Proposed Curb
20
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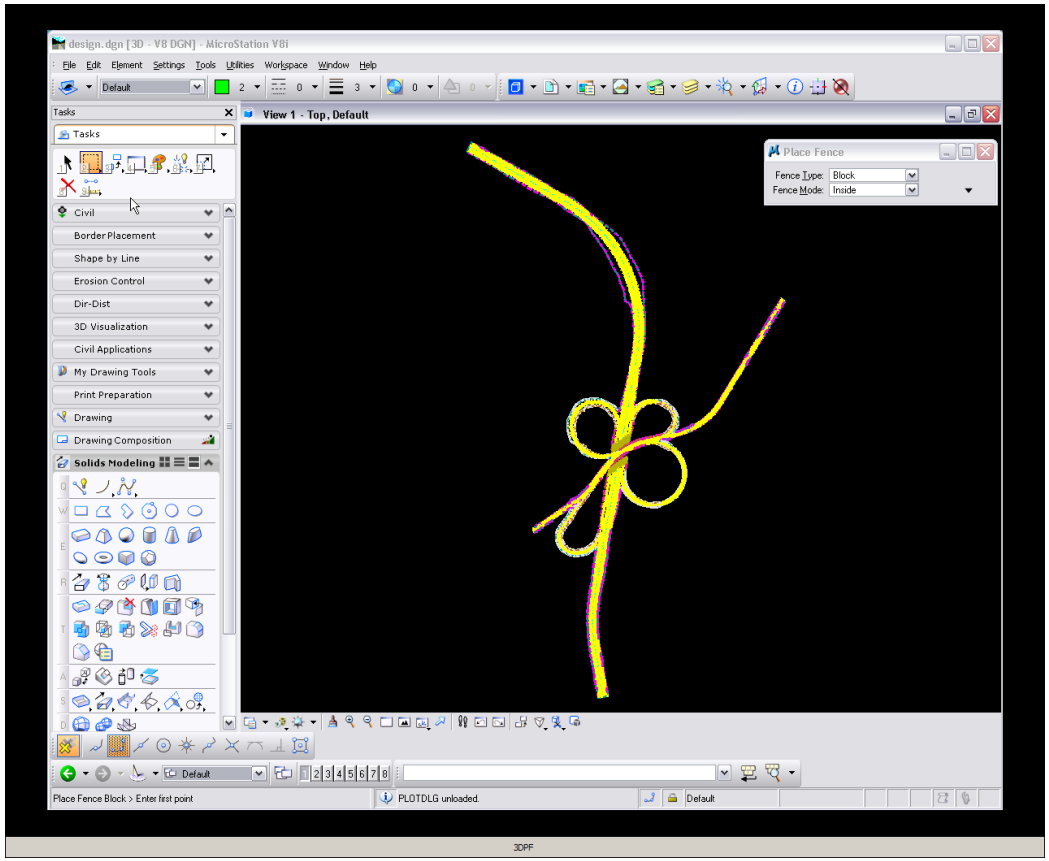
0
View 2, Default
Tasks
Element Selection
Default
1 2 3 4 5 6 7 8
View Attributes
Proposed Curb

NEW! GPS Device Support

- Direct interface to Global Positioning Systems (GPS)
- Track GPS geographic locations in MicroStation
  - Capture a ground track from a GPS device connected to MicroStation for playback
  - Place graphics based on geographic location or tracking path

3D PDF



Available in

MicroStation XM

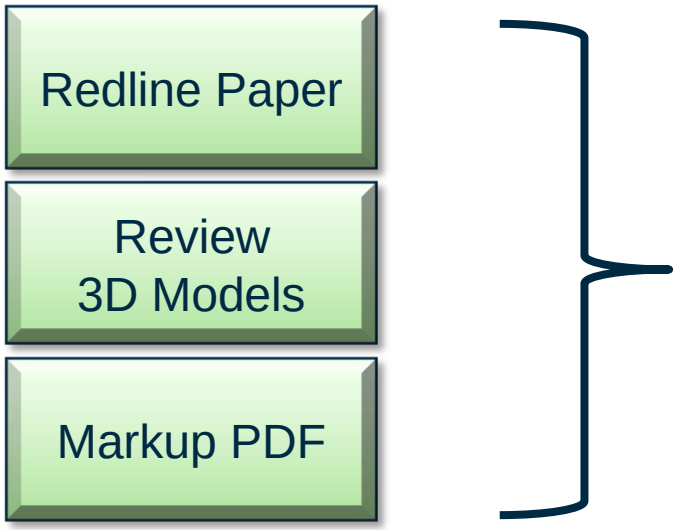
MicroStation V8*i*

- Save 3D model information to a PDF file
- Control lighting
- Rotate models
- Turn levels on and off

Bentley

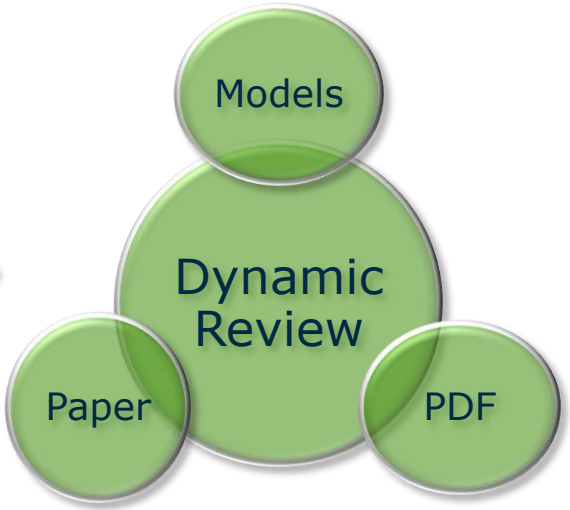
Next Wave

TODAY

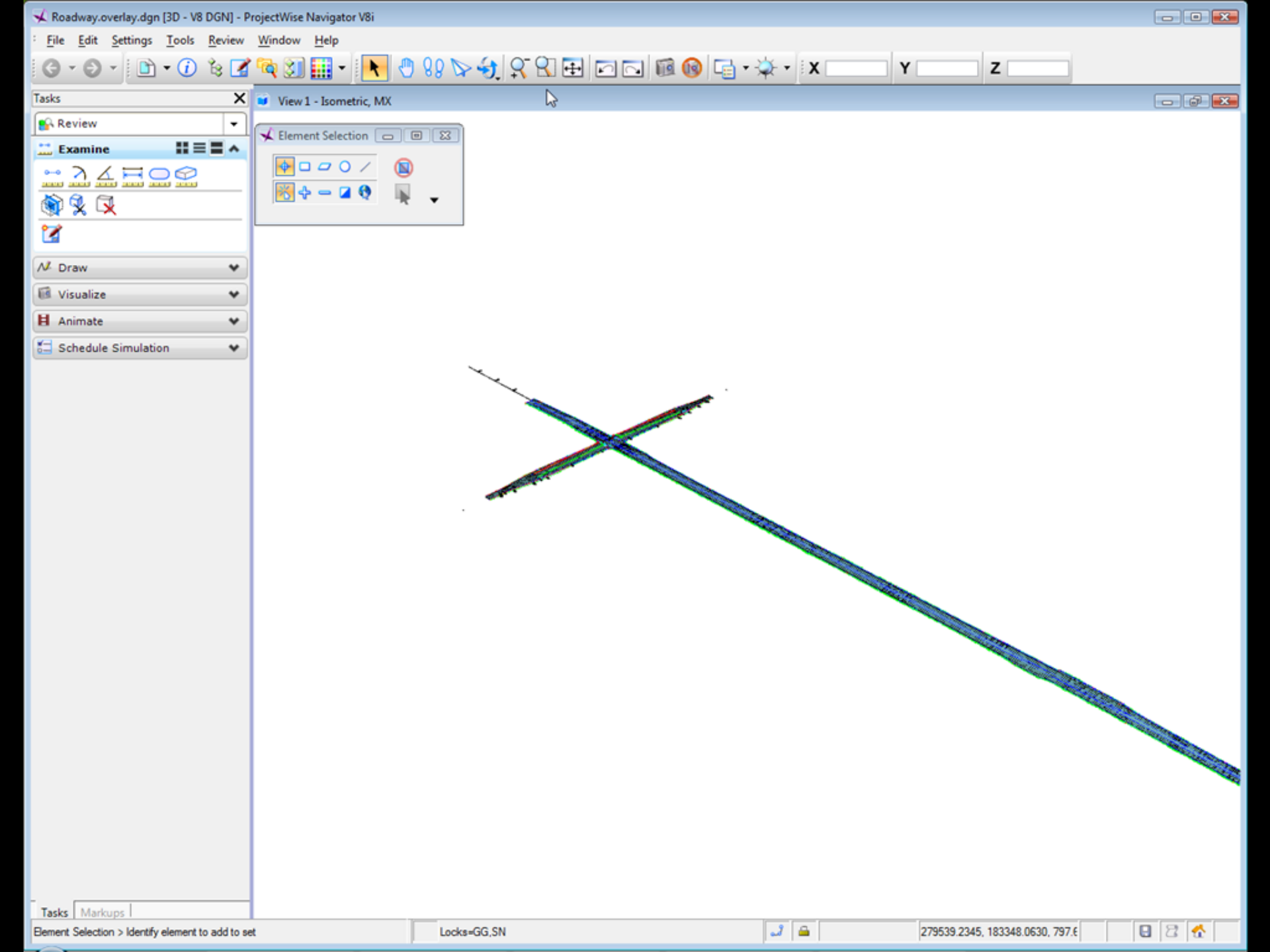


- Separate business process per format
- No change management
- No automation

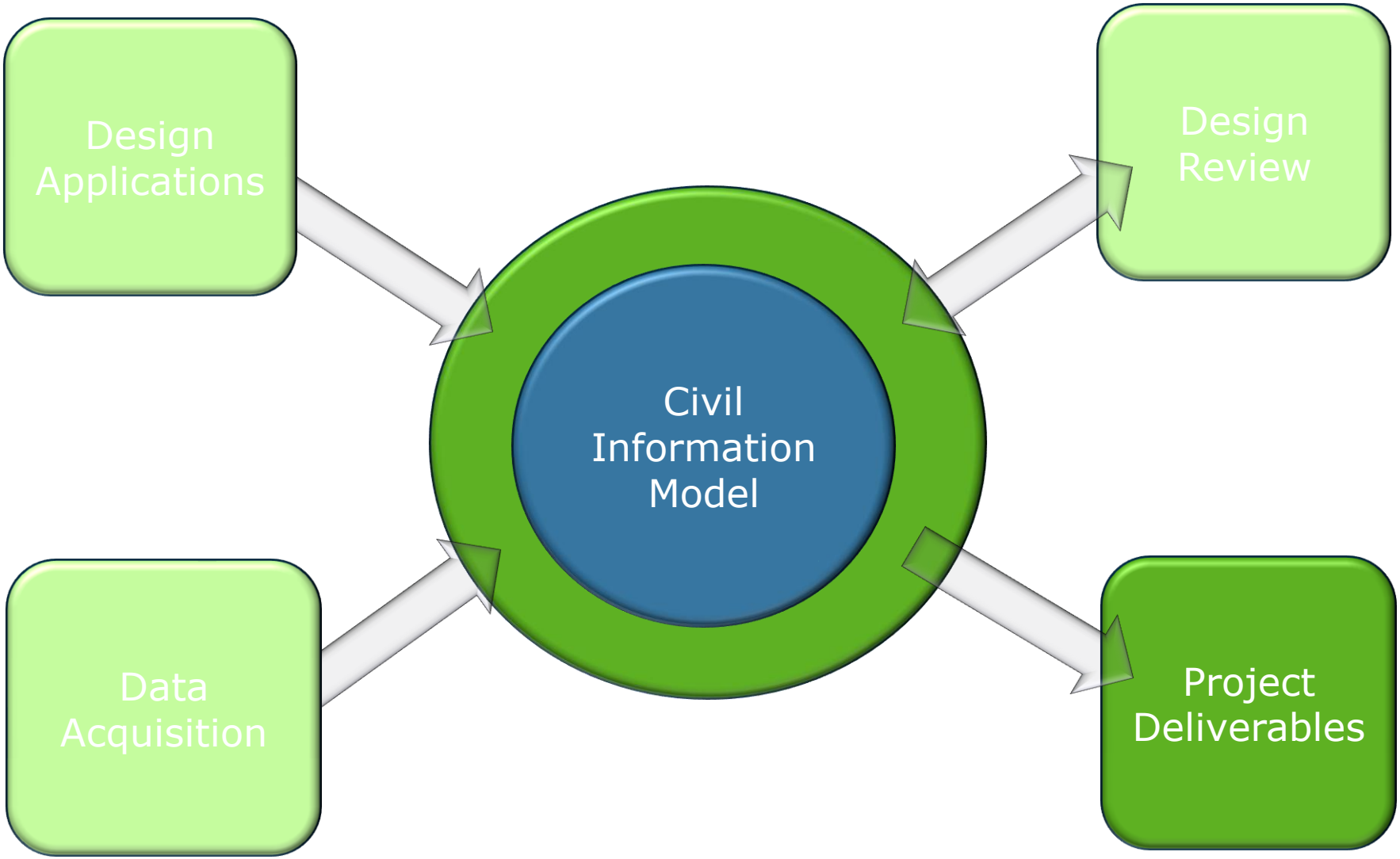
DYNAMIC REVIEW



- One business process
- Change management
- Automation


Roadway.overlay.dgn [3D - V8 DGN] - ProjectWise Navigator V8i
File Edit Settings Tools Review Window Help
X Y Z
Tasks
Review
Examine
Draw
Visualize
Animate
Schedule Simulation
Tasks Markups
View 1 - Isometric, MX
Element Selection
Element Selection > Identify element to add to set
Locks=GG,SN
279539.2345, 183348.0630, 797.6

Civil Information Model



Project Delivery

- Civil Information Model facilitates flexible Project Delivery
  - Machine Control ready 3D models
  - Automated Quantities
  - Machine Control is gaining but drawings are still King
    - 2D, 3D and intelligent PDF creation
- ProjectWise integration facilitates distributed project deliveries
  - Manage just-in-time distribution
  - Automated Change Management

Bentley Civil Evolution

- **Preserving your investment**

Evolution not revolution

- Migrate and Integrate the use of new tools and technology when you want
- Its our job to make you want to move forward by adding ROI to the product

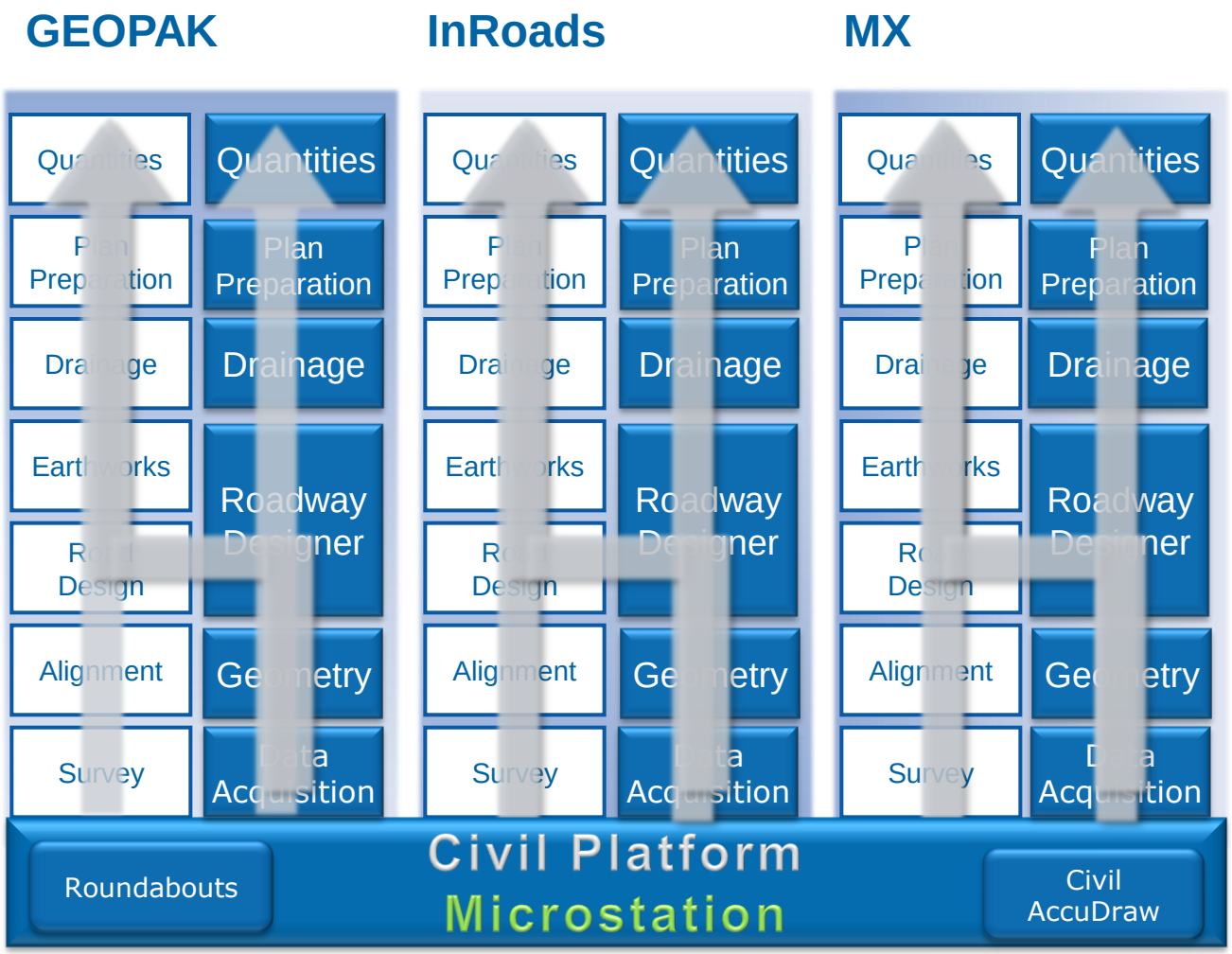
Your investment in

- File formats, options, and fidelity
- Standards
- Training and workflows

Your productivity

- History of keeping our customers productive through technological changes and advancements

Bentley Civil Evolution



- 20+ years of success in designing the worlds Civil infrastructure projects
- XM: Began the Evolution
- V8*i*: Began the Platform
- V8*i* *(SELECTseries 1)* : Consolidates the Modeling and Data Acquisition
- The Evolution will continue

Be Employable

Bentley offers free software and training to out-placed infrastructure professionals

- Training in **V8*i*** or **XM** software
- Gain new skills using Bentley technology
- Be more competitive in today's job market
- Help us spread the word!

A free service from

Be Careers Network

Roads and Bridges Conference

20 Years of 3D Modeling!

October 19-21, 2009 Charlotte, NC

- Roads, bridges, sites, survey, storm & sanitary
- GEOPAK, InRoads, Haestad, LEAP Bridge, RM Bridge, MicroStation, ProjectWise, and more!
- Earn *Professional Development Hours*
- General info, agenda, and registration:

http://www.bentley.com/en-US/Community/Be+Connected/

THANK YOU!

Have a great conference!